http://www.ncbi.nlm.nih.gov/entrez

1: AY207429. Homo sapiens inte...[gi:27501935] Links

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LOCUS       AY207429                 9803 bp    DNA     linear   PRI 05-JAN-
2003
DEFINITION  Homo sapiens interleukin 11 (IL11) gene, complete cds.
ACCESSION   AY207429
VERSION     AY207429.1  GI:27501935
KEYWORDS    .
SOURCE      Homo sapiens (human)
  ORGANISM  Homo sapiens
            Eukaryota; Metazoa; Chordata; Craniata; Vertebrata;
Euteleostomi;
            Mammalia; Eutheria; Primates; Catarrhini; Hominidae; Homo.
REFERENCE   1  (bases 1 to 9803)
  AUTHORS   Rieder,M.J., Carrington,D.P., da Ponte,S.H., Hastings,N.C.,
            Ahearn,M.O., Kuldanek,S.A., Rajkumar,N., Toth,E.J., Yi,Q. and
            Nickerson,D.A.
  TITLE     Direct Submission
  JOURNAL   Submitted (26-DEC-2002) Genome Sciences, University of
Washington,
            1705 NE Pacific, Seattle, WA 98195, USA
COMMENT     To cite this work please use:  SeattleSNPs. NHLBI HL66682
Program
            for Genomic Applications, UW-FHCRC, Seattle, WA (URL:
            http://pga.gs.washington.edu/).
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FIGURE 1

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variation 970
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CDS join(1645..1651,3014..3186,3386..3472,3584..3745,
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/db_xref="GI:27501936"

SEQ ID NO :1

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misc feature 2109..2947
/gene="IL11"
/note="Region not scanned for variation"
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/replace="a"
variation 3638
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/replace="a"
variation 3651
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/frequency="0.01"
/replace="a"
variation 3835
/gene="IL11"
/frequency="0.01"
/replace="a"

FIGURE 1

variation	4064 /gene="IL11" /frequency="0.04" /replace="g"
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variation	4267 /gene="IL11" /frequency="0.38" /replace="t"
variation	4802 /gene="IL11" /frequency="0.18" /replace="g"
repeat region	5003..5113 /rpt_family="Alu" /rpt_type=dispersed
variation	5108 /gene="IL11" /frequency="0.15" /replace="a"
repeat region	5116..5426 /rpt_family="Alu" /rpt_type=dispersed
variation	5154 /gene="IL11" /frequency="0.01" /replace="t"
variation	5157 /gene="IL11" /frequency="0.23" /replace="a"
variation	5199 /gene="IL11" /frequency="0.03" /replace="c"
variation	5288 /gene="IL11" /frequency="0.41" /replace="c"
variation	5970 /gene="IL11" /frequency="0.01" /replace="t"
variation	6068 /gene="IL11" /frequency="0.01" /replace="a"
variation	6077 /gene="IL11" /frequency="0.02" /replace="t"

FIGURE 1

variation	6092 /gene="IL11" /frequency="0.17" /replace="a"
variation	6212 /gene="IL11" /frequency="0.15" /replace="g"
variation	6448 /gene="IL11" /frequency="0.10" /replace="a"
variation	6494 /gene="IL11" /frequency="0.10" /replace="c"
variation	6576 /gene="IL11" /frequency="0.11" /replace="a"
variation	6591 /gene="IL11" /frequency="0.05" /replace="t"
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variation	7083 /gene="IL11" /frequency="0.17" /replace="a"
variation	7161 /gene="IL11" /frequency="0.07" /replace="a"
repeat region	7170..7298 /rpt_family="Alu" /rpt_type=dispersed
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repeat region	7299..7523 /rpt_family="L1" /rpt_type=dispersed

FIGURE 1

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variation	9596 /frequency="0.03" /replace="t"
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FIGURE 1

SEQ ID NO:73:

BASE COUNT 2004 a 3117 c 2797 g 1885 t

ORIGIN

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```

FIGURE 1

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6481 gtggaggtcc cgagtgggcg gggcagcgac tgggagatgg gtcggtcacc cagacagctc
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FIGURE 1

```
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9541 cctggccctg gacgcccctg acaacgaggt gggcttcctg ttccactgct gggtccgcct
9601 catcaacctg cttcaggagc cggctcccac ctggaccccc aggaccacgc gcacggcccc
9661 cctggatatg ccgctggcca aagcgcctgc ctccacctgg cacctgcagg tgggatccca
9721 gctccacaga ccagggcatg gcaggcccca ggaaccctcc ggccagatcc agaggggact
9781 cgaccaagag cccaaagtct agg
//
```

FIGURE 1

Complete native human IL-11 -SEQ ID NO:1-:

```
      1          11         21         31         41         51
    1 MNCVCRLVLV VLSLWPDTAV APGPPPGPPR VSPDPRAELD STVLLTRSLL ADTRQLAAQL    60
   61 RDKFPADGDH NLDSLPTLAM SAGALGALQL PGVLTRLRAD LLSYLRHVQW LRRAGGSSLK   120
  121 TLEPELGTLQ ARLDRLLRRL QLLMSRLALP QPPPDPPAPP LAPPSSAWGG IRAAHAILGG   180
  181 LHLTLDWAVR GLLLLKTRL
```

Complete native macaque IL-11 (Macaca fascicularis) -SEQ ID NO:2- :

```
      1          11         21         31         41         51
    1 MNCVCRLVLV VLSLWPDTAV APGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL    60
   61 KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK   120
  121 TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG   180
  181 LHLTLDWAVR GLLLLKTRL
```

Complete native mouse IL-11 (Mus musculus) -SEQ ID NO:3- :

```
      1          11         21         31         41         51
    1 MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM    60
   61 RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK   120
  121 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG   180
  181 LHLTLDWAVR GLLLLKTRL
```

Complete native rat IL-11 (Rattus norvegicus) -SEQ ID NO:4- :

```
      1          11         21         31         41         51
    1 MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM    60
   61 RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK   120
  121 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG   180
  181 LHLTLDWAVR GLLLLKTRL
```

FIGURE 2

Native human IL-11 deleted from the 34 first aminoacids -SEQ ID NO :5-:

PRAELD STVLLTRSLL ADTRQLAAQL RDKFPADGDH NLDSLPTLAM SAGALGALQL PGVLTRLRAD LLSYLRHVQW LRRAGGSSLK TLEPELGTLQ ARLDRLLRRL QLLMSRLALP QPPPDPPAPP LAPPSSAWGG IRAAHAILGG LHLTLDWAVR GLLLLKTRL

Native macaque IL-11 deleted from the 34 first aminoacids -SEQ ID NO:6- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LHLTLDWAVR GLLLLKTRL

Native mouse IL-11 deleted from the 34 first aminoacids -SEQ ID NO:7- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LHLTLDWAVR GLLLLKTRL

Native rat IL-11 deleted from the 34 first aminoacids -SEQ ID NO:8- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LHLTLDWAVR GLLLLKTRL

FIGURE 3

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :9-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGTLQARLDRLLRRL
QLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLX_1LTLX_2WAVRGLL
LLKTRL wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :10-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGTLQARLDRLLRRL
QLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLVLTLAWAVRGLLL
LKTRL

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :11-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGTLQARLDRLLRRL
QLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLALTLVWAVRGLLL
LKTRL

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :12-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGTLQARLDRLLRRL
QLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLVLTLVWAVRGLLL
LKTRL

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :13-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGTLQARLDRLLRRL
QLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLALTLAWAVRGLLL
LKTRL

FIGURE 4

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :14-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGT
LQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLX_1
LTLX_2WAVRGLLLLKTRL
wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :15-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGT
LQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLVL
TLAWAVRGLLLLKTRL

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :16-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGT
LQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLAL
TLVWAVRGLLLLKTRL

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :17-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGT
LQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLVL
TLVWAVRGLLLLKTRL

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :18-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDSL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSSLKTLEPELGT
LQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRAAHAILGGLAL
TLAWAVRGLLLLKTRL

FIGURE 5

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :19-:

MNCVCRLVLVVLSLWPDTAVAPGPPPGPPRVSPDPRAELDSTVLLTRSLLADTR
QLAAQLRDKFPADGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
VQWLRRAGGSSLKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPL
APPSSAWGGIRAAHAILGGLX_1LTLX_2WAVRGLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :20-:

MNCVCRLVLVVLSLWPDTAVAPGPPPGPPRVSPDPRAELDSTVLLTRSLLADTR
QLAAQLRDKFPADGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
VQWLRRAGGSSLKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPL
APPSSAWGGIRAAHAILGGLVLTLAWAVRGLLLLKTRL

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :21-:

MNCVCRLVLVVLSLWPDTAVAPGPPPGPPRVSPDPRAELDSTVLLTRSLLADTR
QLAAQLRDKFPADGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
VQWLRRAGGSSLKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPL
APPSSAWGGIRAAHAILGGLALTLVWAVRGLLLLKTRL

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :22-:

MNCVCRLVLVVLSLWPDTAVAPGPPPGPPRVSPDPRAELDSTVLLTRSLLADTR
QLAAQLRDKFPADGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
VQWLRRAGGSSLKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPL
APPSSAWGGIRAAHAILGGLVLTLVWAVRGLLLLKTRL

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :23-:

MNCVCRLVLVVLSLWPDTAVAPGPPPGPPRVSPDPRAELDSTVLLTRSLLADTR
QLAAQLRDKFPADGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
VQWLRRAGGSSLKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPL
APPSSAWGGIRAAHAILGGLALTLAWAVRGLLLLKTRL

FIGURE 6

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:24- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:25- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:26- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:27- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:28- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 7

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:29- :

PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

***IL-11 mutein deriving from 21aa-deleted native macaque* IL-11 -SEQ ID NO:30- :**
PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:31- :
PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:32- :
PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:33- :
PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 8

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:34- :

MNCVCRLVLV VLSLWPDTAV APGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG $L\underline{X_1}LTL\underline{X_2}WAVR$ GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:35- :

MNCVCRLVLV VLSLWPDTAV APGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L<u>V</u>LTL<u>A</u>WAVR GLLLLKTRL

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:36- :

MNCVCRLVLV VLSLWPDTAV APGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L<u>A</u>LTL<u>V</u>WAVR GLLLLKTRL

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:37- :

MNCVCRLVLV VLSLWPDTAV APGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L<u>V</u>LTL<u>V</u>WAVR GLLLLKTRL

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:38- :

MNCVCRLVLV VLSLWPDTAV APGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLLRRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L<u>A</u>LTL<u>A</u>WAVR GLLLLKTRL

FIGURE 9

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:39- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:40- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:41- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:42- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:43- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 10

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:44- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:45- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:46- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:47- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:48- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 11

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:49- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:50- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG L<u>V</u>LTL<u>A</u>WAVR GLLLLKTRL

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:51- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG L<u>A</u>LTL<u>V</u>WAVR GLLLLKTRL

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:52- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG L<u>V</u>LTL<u>V</u>WAVR GLLLLKTRL

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:53- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG L<u>A</u>LTL<u>A</u>WAVR GLLLLKTRL

<u>FIGURE 12</u>

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:54- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:55- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:56- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:57- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:58- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 13

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:59- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:60- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:61- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:62- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:63- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 14

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:64- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LX_1LTLX_2WAVR GLLLLKTRL

wherein X_1 and X_2 are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:65- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LVLTLAWAVR GLLLLKTRL

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:66- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLVWAVR GLLLLKTRL

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:67- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LVLTLVWAVR GLLLLKTRL

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:68- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLAWAVR GLLLLKTRL

FIGURE 15

Joined CDS for human complete native IL-11 –SEQ ID NO:69-:

atg aac tgt gtt tgc cgc ctg gtc ctg gtc gtg ctg agc ctg tgg cca gat aca gct gtc gcc cct ggg cca cca cct ggc ccc cct cga gtt tcc cca gac cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg **cac** ctg aca ctt **gac** tgg gcc gtg agg gga ctg ctg ctg ctg aag act cgg ctg tga

Joined CDS for the IL-11 mutein which derives from the 34aa-deleted human IL-11 – SEQ ID NO:70-:

cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg **$n_1n_2n_3$** ctg aca ctt **$n_4n_5n_6$** tgg gcc gtg agg gga ctg ctg ctg ctg aag act cgg ctg tga

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are both chosen among the group comprising the nucleotide codons which codes for a hydrophobic aminoacid, namely for Alanine (A), Valine (V), Leucine (L), Isoleucine (I), Phenylalanine (F), Methionine (M), Proline (P), Tryptophan (W).

$n_1n_2n_3$ and $n_4n_5n_6$ can be chosen among the group comprising the following nucleotide codons:

- GCT, GCC, GCA, GCG
- GTT, GTC, GTA, GTG,
- TTA, TTG, CTT, CTC, CTA, CTG,
- ATT, ATC, ATA,
- TTT, TTC,
- ATG,
- CCT, CCC, CCA, CCG,
- TGG.

FIGURE 16A

Joined CDS for the IL-11 mutein which derives from the 21aa-deleted human IL-11 – SEQ ID NO:71-:

cct ggg cca cca cct ggc ccc cct cga gtt tcc cca gac cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg $\underline{n_1n_2n_3}$ ctg aca ctt $\underline{n_4n_5n_6}$ tgg gcc gtg agg gga ctg ctg ctg ctg aag act cgg ctg tga

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are as defined in Figure 16A.

Joined CDS for the IL-11 mutein which derives from the complete human IL-11 –SEQ ID NO:72-:

atg aac tgt gtt tgc cgc ctg gtc ctg gtc gtg ctg agc ctg tgg cca gat aca gct gtc gcc cct ggg cca cca cct ggc ccc cct cga gtt tcc cca gac cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg $\underline{n_1n_2n_3}$ ctg aca ctt $\underline{n_4n_5n_6}$ tgg gcc gtg agg gga ctg ctg ctg ctg aag act cgg ctg tga

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are as defined in Figure 16A.

FIGURE 16B

Mutated AY207429 nucleic acid -SEQ ID NO:74-:

```
   1 acacctgtat tcccaccact ttgggaggct gaggcgggag gatgacctga gctcaggagt
  61 ttgagaccag cctgggcaac atggcaaaac cctatctcta ctaaaaatac aaaaaatagc
 121 caggcatggt ggcgggtgcc tgtaatccca gctactcagg aggctgaggc atgagaatca
 181 cttgaacctg ggaggcggag gttacagtga gctgagatca caccactgca ccccagcctg
 241 ggtgacacag cgagactctg tctcaaaaaa accaaaaacg aggccaggca cggtagctca
 301 cacctgtcat cccagcactt tgggaggccg aggcaggcgg atcacgaagt caggagttcg
 361 agaccagcct ggccaacatg gtaagacccc gtctctacta aaaatacaaa attagccggg
 421 tgtggtggcg cacacctgta atcccagcta cttgggaggc tgaggcagga gaatcgcttg
 481 aacccgggag gtggaggttg cagtgagctg agattgtgcc attgatcgcg ccattgcact
 541 ccagcctggg tgacagagtg agactcagta ccaaaaaaca aacaaacaaa aaacaaacaa
 601 aaaatgagaa aggcttttac tctctgcccc cattgctgag tccccaacat ctcagcgtct
 661 ctgtctttct aatatctctg tctccccttt tctgtccctg gggcctctcc gtccctgtca
 721 ctctgccccg tgtctctgtt tgcctggtgc ctttcttcag ctgcggcatc ctctgtctca
 781 gagtcttggt gtctctgttc ctttcccctc ggggtctccc tgggtctccc caagtccctc
 841 ctgctgtctt cctcccgctc tctgatctct gactcccaga acctctccct ctgtctccag
 901 ggctgccccc ctgatcctct ttgcttctct ggtgtgtctc tctggctgcc tccatctctg
 961 tggatctccg tctccctgtc tctgtctcag tctgtccttc actctgtgtg tgtgtgtgtg
1021 tgtctctctc tctctctctc cttcccttcc actccctctt cctcctgcct ccacctctcc
1081 aggcccctgt cttgtccctc cgtccggcct ttctctgcct ttccgtcctc ctgcctcccc
1141 atctctctct gctagtcctg gtccagccgg acccccaccc acagtcgggc cccagcgctt
1201 gagcctgagt gtctgctccg gcccgtggag gtggagggag gggacgccaa tgacctcacc
1261 agcccctctc cgaccacccc ccccttttcc ttttcaactt ttccaacttt tccttccgtg
1321 ccctcctccg agcgcggcgg cgtgagccct gcaaggcagc cgctccgtct gaatggaaaa
1381 ggcaggcagg gagggtgagt caggatgtgt caggccgccc tcccctgccg cctgcccccc
1441 gcccgcccgc cccagccccc tatataaccc cccaggcgtc cacactccct cactgccgcg
1501 gccctgctgc tcagggcaca tgcctccccc ccccaggccg cggcccagct gaccctcggg
1561 gctcccccgg cagcggacag ggaagggtta aaggcccccg gctccctgcc ccctgccctg
1621 gggaacccct ggccctgtgg ggacatgaac tgtaagttgg ttcatgggga gggtggaggg
1681 gacagggagg cagggaggag agggacccac ggcgggggtg ggagcagacc ccgctgagtc
1741 gcacagagag ggacccggag acaggcagcc ggggaggaga gcagcttcgg agacaggagg
1801 cggcggagga gatgggcaga gagagacaca gacaggagcg gatggaggca gccaatcaga
1861 ggcgccgcag gagggacggg ccagacaggg ccccgagagg gagcgagacg cggagaccga
1921 gcaggggcag ggacgcaggg actggtgccg ggagggaggt gacccccatc gacccaggcc
1981 ccagggagcc cgcggggacc gggagactcc ctgggattcc ggcagagagg ctccggaggg
2041 aaactgaggc agggtccgcg gagagcggag caagccaggg agtagcgacc ccagccgggg
2101 ggaggagaga gactgggcgc gggggggaaag cggggagagc cgggcagatg cggccgacgg
2161 aggcgcggac agaccgacgg ctggcgggcc cgggggggcgg gctgggggtg tgcgaggcgc
2221 gggcggccgg ggagcgctga ttggctggcg ggtggccggg tgggcggggc ggccggggtg
2281 ggctgcgggg agcgagctcc ggacccccgc gccccccgcg ccccccgcgc cccccgccgc
2341 cagctctccc gctcccgcgg cccggccggg cccatggctc tgcccctctc cgcccaggtg
2401 cgctgcggcc cgggcttctg ccgcccaccc ggcggggctc ctgggagggc gtctaagggg
2461 tctcccgtgg gagaggtccg tgtctcccgg gctccgtcct ggcttctggc tccttccccc
2521 gctcccagcc agctcgggct cccgcggccc ggggagggggg caggttctgg cctgtgcctc
2581 ccccaccatg ccccgccccg gggcccagat tccggcgtcc gggggcggac gggagacgcc
2641 cggcccgtct acccgccccg ggccgcgtct gctccgacgg gcggggcagc cagagccagg
2701 gagggagagg gaagcccgcc tggccctgcg acctgcccgc gggcgttcca ccctgggact
2761 taagacctcc agctccatcc tccctaaggc cgggagtcca ggccccagac cctcctcccc
2821 gagacccagg agtccagacc ccaggccttc ctccctcaga cctaggagtc caggccccca
2881 gcctctcctc cctcagaccc aggaggagtc cagaccccag ttcctcctcc ctcagacccg
2941 ggagtccagg cccaggccct cctctctcag acccggagtc cagcctgagc tctctgcctt
3001 atcctgcccc caggtgtttg ccgcctggtc ctggtcgtgc tgagcctgtg gccagataca
3061 gctgtcgccc ctgggccacc acctggcccc cctcgagttt ccccagaccc tcgggccgag
3121 ctggacagca ccgtgctcct gacccgctct ctcctggcgg acacgcggca gctggctgca
3181 cagctggtag gagagactgg gctggggcca gcacaggagt gagaggcaga gaggaacgga
```

FIGURE 17

3241 gaggagtctg cgggcagcca cttggagggg ttctgggctc tcaggtggca gagtgaggga
3301 ggggaagagt tgggggcctg gcgtgggggа tggagggagc cccgaggctg ggcaggggcc
3361 acctcacagc ttttttccct gccagaggga caaattccca gctgacgggg accacaacct
3421 ggattccctg cccaccctgg ccatgagtgc gggggcactg ggagctctac aggtaagggc
3481 aagggagtgg gctggggaca aggtgggagg caggcagtga agggggcggg gaggatgagg
3541 ggcactggtc gggtgttctc tgatgtcccg gctctatccc cagctcccag gtgtgctgac
3601 aaggctgcga gcggacctac tgtcctacct gcggcacgtg cagtggctgc gccgggcagg
3661 tggctcttcc ctgaagaccc tggagcccga gctgggcacc ctgcaggccc gactggaccg
3721 gctgctgcgc cggctgcagc tcctggtatg tcctggcccc aagacctgac accccagacc
3781 cccacccctg gccccaaaat cctgtggcct gagtccttga agcctgagac cccagacccg
3841 agtgcaacag ccccgctctg agaccctgac accctaacag cccgctctga gaccctgaca
3901 ccgtaacagc cccgctctga gaccctgacc ctaacagtcc tgctctgaga ccctgaccct
3961 gcagtcccaa gatcctgtgg ccctgagacc ctgaggccct agaccccaa atcctgccca
4021 gaaacttcaa attctcaccc aagaccctga gactccatca tccatgacct caaagtcccc
4081 agatcccagc ccctaagacc caagacccca tcctgaagcc caaagccttg agaattcaaa
4141 tcctcacctc aagacttgga gaccctggcc ccatgacatt gaaaaccatg gacctggcca
4201 ggcgtggtgg ctcacgcctg taatcccagc actttgggag gccgaggcaa gtggatcacc
4261 tgaggtcggg agttcaagac cagccagacc aacatggtga aaccctgtct ctactaaaaa
4321 tacaaaatta gccaggcgtg gtggtgcatg cctgtaatcc cagctacttg ggaggctgag
4381 gcaggagaat cgcttgaacc tgggaggcgg aggttgcagt gagccgagat cgcaccatta
4441 cactccagcc tgggcaacaa gagcaaaact ccctctctct caaaaaaaaa aaaaaaaaaa
4501 aaaagaagga aaagaaaacc atggacctcc agaccctgag accccaggcc ccagccctga
4561 gatcctgaca tcttaaagat cccaggccct aagatacaag accttgaccc aaagccagcc
4621 ttgggaccct ggctgtacaa acccaagacc tccaggacct agaccccgag ccctgaggcc
4681 ctatgtctca ctcccaacat cgaaaaccct gacacctcag atcctgagcc tgcgcctgta
4741 cgactccaag accctcactt ccaaagccag gcccaaagcc ctgagaccag aagacttcaa
4801 accctggttc ttgggcctaa ctccaaagac cctggatctc aaattccaac ttctagctct
4861 gagactccag ccctcaccca tgagttcctg aacttgaacc cagagacccc atctctaaga
4921 cttcagcctt gagatccagg gcctgaccct agactcgagc ccacagacct cagatactgt
4981 ctgtaaaacc ccagctctgg tggggagcag tggctcactc ctgtaatccc aaggcagggg
5041 aggccaaggc agaaggacct cttgaggcca tgagtttgag acagcctggg cagcatagca
5101 agactctgtt tcttaattat tattattatt attatttttt ggagacagag tctcgcgctc
5161 tgttgcccag gctagagtgc aatggtgcca tttcggcttg ctggaacctc cgcctcctgg
5221 gctcaagcga ttctcctgcc tcagcctcct gagtagctgg gacttcaggt gcacactgcc
5281 acacccggat aatttttttg tattttagta gacacagggt ttcaccgtgt tgcccaggct
5341 ggtcacaaac tcctgagctc aggccatccg cccgcctcgg cctcccaaag cgctgggata
5401 acaggcgtga tcccgcgcgc ctggcttctt aattgttcta acagcagcca caacaacaaa
5461 aacccagctc tgagattcca gccccggcga ctctaacagt cccaggcccg atccctcacc
5521 tagaaccgag atgccagccc tgactccaca gacttcaccc ccaaccccca cactcagctc
5581 tggaagcccg tcctgactcc agcctccatt ttcggaaccc cacagcctga agagctcccg
5641 gcctaaacac ttcaccccac gcgccacagt ccccctgtga atatgcagcc ccgattcagc
5701 tgcagctcca cagcaccct gccctgcacc cccgctgcac cccctacctg tgactcacct
5761 ctctcctctc cccacagatg tcccgcctgg ccctgcccca gccacccccg gacccgccgg
5821 cgcccccgct ggcgcccccc tcctcagcct gggggggcat cagggccgcc cacgccatcc
5881 tgggggggct gn1n2n3ctgaca cttn4n5n6tggg ccgtgagggg actgctgctg ctgaagactc
5941 ggctgtgacc cggggcccaa agccaccacc gtccttccaa agccagatct tatttattta
6001 tttatttcag tactgggggc gaaacagcca ggtgatcccc ccgccattat ctcccctag
6061 ttagagacag tccttccgtg aggcctgggg ggcatctgtg ccttatttat acttatttat
6121 ttcaggagca ggggtgggag gcaggtggac tcctgggtcc ccgaggagga ggggactggg
6181 gtcccggatt cttgggtctc caagaagtct gtccacagac ttctgccctg gctcttcccc
6241 atctaggcct gggcaggaac atatattatt tatttaagca attacttttc atgttggggt
6301 ggggacggag gggaaaggga agcctgggtt tttgtacaaa aatgtgagaa acctttgtga
6361 gacagagaac agggaattaa atgtgtcata catatccact tgagggcgat ttgtctgaga
6421 gctggggctg gatgcttggg taactggggc agggcaggtg gaggggagac ctccattcag
6481 gtggaggtcc cgagtgggcg gggcagcgac tgggagatgg gtcggtcacc cagacagctc
6541 tgtggaggca gggtctgagc cttgcctggg gccccgcact gcatagggcc gtttgtttgt

FIGURE 17

```
6601 tttttgagat ggagtctcgc tctgttgcct aggctggagt gcagtgaggc aatctaaggt
6661 cactgcaacc tccacctccc gggttcaagc aattctcctg cctcagcctc ccgattagct
6721 gggatcacag gtgtgcacca ccatgcccag ctaattattt atttcttttg tatttttagt
6781 agagacaggg tttcaccatg ttggccaggc tggtttcgaa ctcctgacct caggtgatcc
6841 tcctgcctcg gcctcccaaa gtgctgggat tacaggtgtg agccaccaca cctgacccat
6901 aggtcttcaa taaatattta atggaaggtt ccacaagtca ccctgtgatc aacagtaccc
6961 gtatgggaca aagctgcaag gtcaagatgg ttcattatgg ctgtgttcac catagcaaac
7021 tggaaacaat ctagatatcc aacagtgagg gttaagcaac atggtgcatc tgtggataga
7081 acgccaccca gccgcccgga gcagggactg tcattcaggg aggctaagga gagaggcttg
7141 cttgggatat agaaagatat cctgacattg gccaggcatg gtggctcacg cctgtaatcc
7201 tggcactttg ggaggacgaa gcgagtggat cactgaagtc caagagtttg agaccggcct
7261 gcgagacatg gcaaaaccct gtctcaaaaa agaaagaatg atgtcctgac atgaaacagc
7321 aggctacaaa accactgcat gctgtgatcc caattttgtg tttttctttc tatatatgga
7381 ttaaaacaaa aatcctaaag ggaaatacgc caaaatgttg acaatgactg tctccaggtc
7441 aaaggagaga ggtgggattg tgggtgactt ttaatgtgta tgattgtctg tattttacag
7501 aatttctgcc atgactgtgt attttgcatg acacatttta aaaataataa acactatttt
7561 tagaataaca gaatatcagc ctcctcctct ccaaaaataa gccctcagga ggggacaaag
7621 ttgaccgctg attgagcctg tcagggctgt gcactaagtg tgggcttttt acttacacaa
7681 tcctcctgga ctcttgaata cgccctgttt tacaggcgag ggaaactgag tctcagacaa
7741 ggagtgggga ctctgttgca caaagtcaca cagctaggga gaggtggaag tgggattctg
7801 cgccgtgtct ggctctttcc caaagctctc tttgcaagtc ggtgttgagg aatcctcgcc
7861 acatgcacac acatgagata tggagaaaca ggttcagtaa ggatttgggt cttacccagg
7921 gcctagagaa gggtcaatgg cagagtaggg atgataattc aaatgcttta gttacttttc
7981 cctttacaat aacccagaca gacttccagg ggccccgtgt cgtcactagt ttgagtctgg
8041 ggttggaggt gcccatcctg ggcccggagt tttgattcac ccatcatagc cctcaagact
8101 ccaggctggc tgggcgcggt ggctcacgcc tgtaatccca gcactttggg aggctgaggc
8161 gggtggatca cttgaggtca ggagttcaag gccagcctga ccaacatgga gaaaccctgt
8221 ctctactaaa aatacaatcc agctactcgg aaggctgagg caggagaatc gctcgaaccc
8281 aggagacggg ggttgcggtg agccgagatc acatcacaaa cagccctagg cagtgcgggg
8341 ccccaggcga ggctcagacc tgcctccaca gagctgtctg ggtgatcgtg cctcctccgt
8401 ggaggcaggg tttgagcctc ccctgggggc cccgcactgc taaggctgtt tgtttttgcg
8461 atggagtctc gctctgttgc ctaggctgga gtgcagtgtg gcaatctaag ctcactgcct
8521 gggcaacaag agtgaaattc catctcaaaa aacaaaaaac aaacaaacaa acaaaaaact
8581 ccaggctgta tccctggagg agaagggagc ccacagtccc cggagagttc ctggaagagg
8641 cccctgtgtg tccgatgagg tcacaaagcc cctccaccag aggctcctcc cccagacccc
8701 tgctgtccac cctggcaggg ccatggcgga ggcccgagtc tcccagcctg gggcatctcc
8761 acgctctgta acgctgagct ccaggcaccc gtgaagcccc acgggtcaag gctggtgggc
8821 cggggctggg aggcctgcac gcctgggttc tgggtcccta aaccagtacc catccaccac
8881 agccaccatg atctggcttc gaaacaggag gtgccttgag ccgctccagg gcaccccgaa
8941 gtgggtccct gttctggggg agctgcaaaa gaccctccag aagggcgagt acctgccctt
9001 ccgtccgctg cccatgttcg agagtaactt tgttcaggtc tccagttccc agtgccccgg
9061 ggctgagagg gacagagggg aagcaaggcc ccccgtgctg ggggatcttg agagggaacg
9121 ggatttagca gtcactgtgt gggggacgat caggagggag gctcaggctg tggctgctgg
9181 aggaaggagt ggtcccagcc ccctctccct ggctgcccca ggtgacccat caaggggcc
9241 cagtgttcgt gaatcacaga accaaccggc tggccatggg cgtggccgcc tccctgccag
9301 gcctggtgtt gcctgacatc ttgctgatcg gccagcccgc cgaggacagg gactgctccg
9361 gcctcgtgct gaccaggtgc cgcatccccc aacccctcgg ccgccccctc caccctcct
9421 gctctagacg ctccctctc cctctcccag gatgatcccc ctggacctcg tccacctctg
9481 cgtccatgac ctctctgcct ggcgcctgaa gctgcgcctg gtctcgggcc gccagtacta
9541 cctggccctg gacgcccctg acaacgaggt gggcttcctg ttccactgct gggtccgcct
9601 catcaacctg cttcaggagc cggctcccac ctggaccccc aggaccacgc gcacggcccc
9661 cctggatatg ccgctggcca aagcgcctgc ctccacctgg cacctgcagg tgggatccca
9721 gctccacaga ccagggcatg gcaggcccca ggaaccctcc ggccagatcc agaggggact
9781 cgaccaagag cccaaagtct agg
```

//

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are as defined in Figure 16A.

FIGURE 17

mRNA of IL-11 mutein deriving from human IL-11 -SEQ ID NO:75-:

gaa ggg uua aag gcc ccc ggc ucc cug ccc ccu gcc cug ggg aac ccc ugg ccc ugu ggg gac aug aac ugu guu ugc cgc cug guc cug guc gug cug agc cug ugg cca gau aca gcu guc gcc ccu ggg cca cca ccu ggc ccc ccu cga guu ucc cca gac ccu cgg gcc gag cug gac agc acc gug cuc cug acc cgc ucu cuc cug gcg gac acg cgg cag cug gcu gca cag cug agg gac aaa uuc cca gcu gac ggg gac cac aac cug gau ucc cug ccc acc cug gcc aug agu gcg ggg gca cug gga gcu cua cag cuc cca ggu gug cug aca agg cug cga gcg gac cua cug ucc uac cug cgg cac gug cag ugg cug cgc cgg gca ggu ggc ucu ucc cug aag acc cug gag ccc gag cug ggc acc cug cag gcc cga cug gac cgg cug cug cgc cgg cug cag cuc cug aug ucc cgc cug gcc cug ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg cug gcg ccc ccc ucc uca gcc ugg ggg ggc auc agg gcc gcc cac gcc auc cug ggg ggg cug $\underline{n_1n_2n_3}$ cug aca cuu $\underline{n_4n_5n_6}$ ugg gcc gug agg gga cug cug cug cug aag acu cgg cug uga ccc ggg gcc caa agc cac cac cgu ccu ucc aaa gcc aga ucu uau uua uuu auu uau uuc agu acu ggg ggc gaa aca gcc agg uga ucc ccc cgc cau uau cuc ccc cua guu aga gac agu ccu ucc gug agg ccu ggg ggg cau cug ugc cuu auu uau acu uau uua uuu cag gag cag ggg ugg gag gca ggu gga cuc cug ggu ccc cga gga gga ggg gac ugg ggu ccc gga uuc uug ggu cuc caa gaa guc ugu cca cag acu ucu gcc cug gcu cuu ccc cau cua ggc cug ggc agg aac aua uau uau uua uuu aag caa uua cuu uuc aug uug ggg ugg gga cgg agg gga aag gga agc cug ggu uuu ugu aca aaa aug uga gaa acc uuu gug aga cag aga aca ggg aau uaa aug ugu cau aca uau cca cuu gag ggc gau uug ucu gag agc ugg ggc ugg aug cuu ggg uaa cug ggg cag ggc agg ugg agg gga gac cuc cau uca ggu gga ggu ccc gag ugg gcg ggg cag cga cug gga gau ggg ucg guc acc cag aca gcu cug ugg agg cag ggu cug agc cuu gcc ugg ggc ccc gca cug cau agg gcc guu ugu uug uuu uuu gag aug gag ucu cgc ucu guu gcc uag gcu gga gug cag uga ggc aau cua agg uca cug caa ccu cca ccu ccc ggg uuc aag caa uuc ucc ugc cuc agc cuc ccg auu agc ugg gau cac agg ugu gca cca cca ugc cca gcu aau uau uua uuu cuu uug uau uuu uag uag aga cag ggu uuc acc aug uug gcc agg cug guu ucg aac ucc uga ccu cag gug auc cuc cug ccu cgg ccu ccc aaa gug cug gga uua cag gug uga gcc acc aca ccu gac cca uag guc uuc aau aaa uau uua aug gaa ggu ucc aca agu cac ccu gug auc aac agu acc cgu aug gga caa gcu gca agg uca aga ugg uuc auu aug gcu gug uuc acc aua gca aac ugg aaa caa ucu aga uau cca aca gug agg guu aag caa cau ggu gca ucu gug

FIGURE 18

gau aga acg cca ccc agc cgc ccg gag cag gga cug uca uuc agg gag gcu aag gag aga ggc uug cuu ggg aua uag aaa gau auc cug aca uug gcc agg cau ggu ggc uca cgc cug uaa ucc ugg cac uuu ggg agg acg aag cga gug gau cac uga agu cca aga guu uga gac cgg ccu gcg aga cau ggc aaa acc cug ucu caa aaa aga aag aau gau guc cug aca uga aac agc agg cua caa aac cac ugc aug cug uga ucc caa uuu ugu guu uuu cuu ucu aua uau gga uua aaa caa aaa ucc uaa agg gaa aua cgc caa aau guu gac aau gac ugu cuc cag guc aaa gga gag agg ugg gau ugu ggg uga cuu uua aug ugu aug auu guc ugu auu uua cag aau uuc ugc cau gac ugu gua uuu ugc aug aca cau uuu aaa aau aau aaa cac uau uuu uag aau

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are both chosen among the group comprising the nucleotide codons which codes for a hydrophobic aminoacid, namely for Alanine (A), Valine (V), Leucine (L), Isoleucine (I), Phenylalanine (F), Methionine (M), Proline (P), Tryptophan (W).
$n_1n_2n_3$ and $n_4n_5n_6$ can be chosen among the group comprising the following nucleotide codons:

- GCU, GCC, GCA, GCG
- GUU, GUC, GUA, GUG,
- UUA, UUG, CUU, CUC, CUA, CUG,
- AUU, AUC, AUA,
- UUU, UUC,
- AUG,
- CCU, CCC, CCA, CCG,
- UGG.

FIGURE18

Gene of IL-11 muteins deriving from human IL-11 – SEQ ID NO:76-:

```
                         gaagggtta aaggcccccg gctccctgcc ccctgccctg
gggaacccct ggccctgtgg ggacatgaac tgtaagttgg ttcatgggga gggtggaggg
gacagggagg cagggaggag agggacccac ggcgggggtg ggagcagacc ccgctgagtc
gcacagagag ggacccggag acaggcagcc ggggaggaga gcagcttcgg agacaggagg
cggcggagga gatgggcaga gagagacaca gacaggagcg gatggaggca gccaatcaga
ggcgccgcag gagggacggg ccagacaggg ccccgagagg gagcgagacg cggagaccga
gcaggggcag ggacgcaggg actggtgccg ggagggaggt gacccccatc gacccaggcc
ccagggagcc cgcggggacc gggagactcc ctgggattcc ggcagagagg ctccggaggg
aaactgaggc agggtccgcg gagagcggag caagccaggg agtagcgacc ccagccgggg
ggaggagaga gactgggcgc ggggggaaag cggggagagc cgggcagatg cggccgacgg
aggcgcggac agaccgacgg ctggcgggcc cgggggggcgg gctgggggtg tgcgaggcgc
gggcggccgg ggagcgctga ttggctggcg ggtggccggg tgggcggggc ggccggggtg
ggctgcgggg agcgagctcc ggaccccccgc gccccccgcg cccccccgcgc cccccgccgc
cagctctccc gctcccgcgg cccggccggg cccatggctc tgcccctctc cgcccaggtg
cgctgcggcc cgggcttctg ccgcccaccc ggcggggctc ctgggagggc gtctaagggg
tctcccgtgg gagaggtccg tgtctcccgg gctccgtcct ggcttctggc tccttccccct
gctcccagcc agctcgggct cccgcggccc ggggaggggg caggttctgg cctgtgcctc
ccccaccatg ccccgccccg gggcccagat tccggcgtcc gggggcggac gggagacgcc
cggcccgtct acccgccccg ggccgcgtct gctccgacgg gcggggcagc cagagccagg
gagggagagg gaagcccgcc tggccctgcg acctgcccgc gggcgttcca ccctgggact
taagacctcc agctccatcc tccctaaggc cgggagtcca ggccccagac cctcctcccc
gagacccagg agtccagacc ccaggccttc ctccctcaga cctaggagtc caggcccccа
gcctctcctc cctcagaccc aggaggagtc cagaccccag ttcctcctcc ctcagacccg
ggagtccagg cccaggccct cctctctcag acccggagtc cagcctgagc tctctgcctt
atcctgcccc caggtgtttg ccgcctggtc ctggtcgtgc tgagcctgtg gccagataca
gctgtcgccc ctgggccacc acctggcccc cctcgagttt ccccagaccc tcgggccgag
ctggacagca ccgtgctcct gacccgctct ctcctggcgg acacgcggca gctggctgca
cagctggtag gagagactgg gctggggcca gcacaggagt gagaggcaga gaggaacgga
gaggagtctg cgggcagcca cttggagggg ttctgggctc tcaggtggca gagtgaggga
ggggaagagt tgggggcctg gcgtgggggа tggagggagc cccgaggctg ggcaggggcc
acctcacagc ttttttccct gccagaggga caaattccca gctgacgggg accacaacct
ggattccctg cccaccctgg ccatgagtgc gggggcactg ggagctctac aggtaagggc
aagggagtgg gctggggaca aggtgggagg caggcagtga agggggcggg gaggatgagg
ggcactggtc gggtgttctc tgatgtcccg gctctatccc cagctcccag gtgtgctgac
aaggctgcga gcggacctac tgtcctacct gcggcacgtg cagtggctgc gccgggcagg
tggctcttcc ctgaagaccc tggagcccga gctgggcacc ctgcaggccc gactggaccg
gctgctgcgc cggctgcagc tcctggtatg tcctggcccc aagacctgac accccagacc
cccacccctg gccccaaaat cctgtggcct gagtccttga agcctgagac cccagacccg
agtgcaacag ccccgctctg agaccctgac accctaacag cccgctctga gaccctgaca
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gcagtcccaa gatcctgtgg ccctgagacc ctgaggccct agacccccaa atcctgccca
gaaacttcaa attctcaccc aagaccctga gactccatca tccatgacct caaagtcccc
agatcccagc ccctaagacc caagacccca tcctgaagcc caaagccttg agaattcaaa
tcctcacctc aagacttgga gaccctggcc ccatgacatt gaaaaccatg gacctggcca
ggcgtggtgg ctcacgcctg taatcccagc actttgggag gccgaggcaa gtggatcacc
tgaggtcggg agttcaagac cagccagacc aacatggtga aaccctgtct ctactaaaaa
tacaaaatta gccaggcgtg gtggtgcatg cctgtaatcc cagctacttg ggaggctgag
gcaggagaat cgcttgaacc tgggaggcgg aggttgcagt gagccgagat cgcaccatta
cactccagcc tgggcaacaa gagcaaaact ccctctctct caaaaaaaaa aaaaaaaaaa
aaaagaagga aaagaaaacc atggacctcc agaccctgag accccaggcc ccagccctga
gatcctgaca tcttaaagat cccaggccct aagatacaag accttgaccc aaagccagcc
ttgggaccct ggctgtacaa acccaagacc tccaggacct agaccccgag ccctgaggcc
ctatgtctca ctcccaacat cgaaaaccct gacacctcag atcctgagcc tgcgcctgta
cgactccaag accctcactt ccaaagccag gcccaaagcc ctgagaccag aagacttcaa
accctggttc ttgggcctaa ctccaaagac cctggatctc aaattccaac ttctagctct
gagactccag ccctcaccca tgagttcctg aacttgaacc cagagacccc atctctaaga
cttcagcctt gagatccagg gcctgaccct agactcgagc ccacagacct cagatactgt
```

FIGURE 19

ctgtaaaacc ccagctctgg tggggagcag tggctcactc ctgtaatccc aaggcagggg
aggccaaggc agaaggacct cttgaggcca tgagtttgag acagcctggg cagcatagca
agactctgtt tcttaattat tattattatt attatttttt ggagacagag tctcgcgctc
tgttgcccag gctagagtgc aatggtgcca tttcggcttg ctggaacctc cgcctcctgg
gctcaagcga ttctcctgcc tcagcctcct gagtagctgg gacttcaggt gcacactgcc
acacccggat aatttttttg tattttagta gacacagggt ttcaccgtgt tgcccaggct
ggtcacaaac tcctgagctc aggccatccg cccgcctcgg cctcccaaag cgctgggata
acaggcgtga tcccgcgcgc ctggcttctt aattgttcta acagcagcca caacaacaaa
aacccagctc tgagattcca gccccggcga ctctaacagt cccaggcccg atccctcacc
tagaaccgag atgccagccc tgactccaca gacttcaccc ccaacccccа cactcagctc
tggaagcccg tcctgactcc agcctccatt ttcggaaccc cacagcctga agagctcccg
gcctaaacac ttcaccccac gcgccacagt ccccctgtga atatgcagcc ccgattcagc
tgcagctcca cagcaccect gccctgcacc cccgctgcac cccctacctg tgactcacct
ctctcctctc cccacagatg tcccgcctgg ccctgcccca gccacccccg gacccgccgg
cgcccccgct ggcgcccccc tcctcagcct gggggggcat cagggccgcc cacgccatcc
tgggggggct gn$_1$n$_2$n$_3$ctgaca cttn$_4$n$_5$n$_6$tggg ccgtgagggg actgctgctg ctgaagactc
ggctgtgacc cggggcccaa agccaccacc gtccttccaa agccagatct tatttattta
tttatttcag tactgggggc gaaacagcca ggtgatcccc ccgccattat ctccccctag
ttagagacag tccttccgtg aggcctgggg ggcatctgtg ccttatttat acttatttat
ttcaggagca ggggtgggag gcaggtggac tcctgggtcc ccgaggagga ggggactggg
gtcccggatt cttgggtctc caagaagtct gtccacagac ttctgccctg gctcttcccc
atctaggcct gggcaggaac atatattatt tatttaagca attacttttc atgttggggt
ggggacggag gggaaaggga agcctgggtt tttgtacaaa aatgtgagaa acctttgtga
gacagagaac agggaattaa atgtgtcata catatccact tgagggcgat ttgtctgaga
gctggggctg gatgcttggg taactggggc agggcaggtg gaggggagac ctccattcag
gtggaggtcc cgagtgggcg gggcagcgac tgggagatgg gtcggtcacc cagacagctc
tgtggaggca gggtctgagc cttgcctggg gccccgcact gcatagggcc gtttgtttgt
tttttgagat ggagtctcgc tctgttgcct aggctggagt gcagtgaggc aatctaaggt
cactgcaacc tccacctccc gggttcaagc aattctcctg cctcagcctc ccgattagct
gggatcacag gtgtgcacca ccatgcccag ctaattattt atttcttttg tatttttagt
agagacaggg tttcaccatg ttggccaggc tggtttcgaa ctcctgacct caggtgatcc
tcctgcctcg gcctcccaaa gtgctgggat tacaggtgtg agccaccaca cctgacccat
aggtcttcaa taaatattta atggaaggtt ccacaagtca ccctgtgatc aacagtaccc
gtatgggaca aagctgcaag gtcaagatgg ttcattatgg ctgtgttcac catagcaaac
tggaaacaat ctagatatcc aacagtgagg gttaagcaac atggtgcatc tgtggataga
acgccaccca gccgcccgga gcagggactg tcattcaggg aggctaagga gagaggcttg
cttgggatat agaaagatat cctgacattg gccaggcatg gtggctcacg cctgtaatcc
tggcactttg ggaggacgaa gcgagtggat cactgaagtc caagagtttg agaccggcct
gcgagacatg gcaaaaccct gtctcaaaaa agaaagaatg atgtcctgac atgaaacagc
aggctacaaa accactgcat gctgtgatcc caattttgtg tttttctttc tatatatgga
ttaaaacaaa aatcctaaag ggaaatacgc caaaatgttg acaatgactg tctccaggtc
aaaggagaga ggtgggattg tgggtgactt ttaatgtgta tgattgtctg tattttacag
aatttctgcc atgactgtgt attttgcatg acacatttta aaaataataa acactatttt
tagaat

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are as defined in Figure 16A.

FIGURE 19

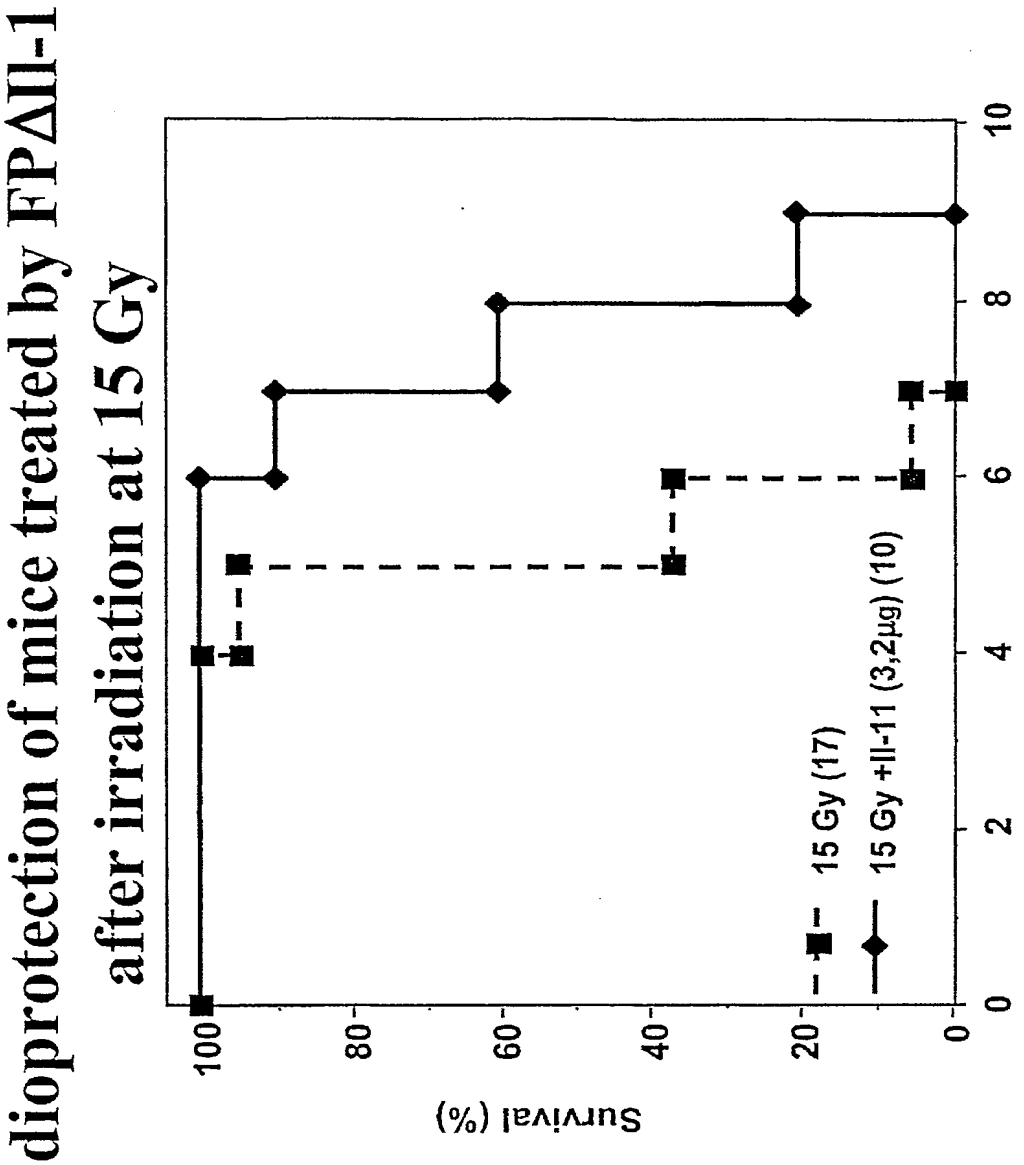
Radioprotection of mice treated by FPΔII-1 after irradiation at 15 Gy
Survival (%)
100
80
60
40
20
0
0
2
4
6
8
10
Days
15 Gy (17)
15 Gy +Il-11 (3,2µg) (10)

FIGURE 20

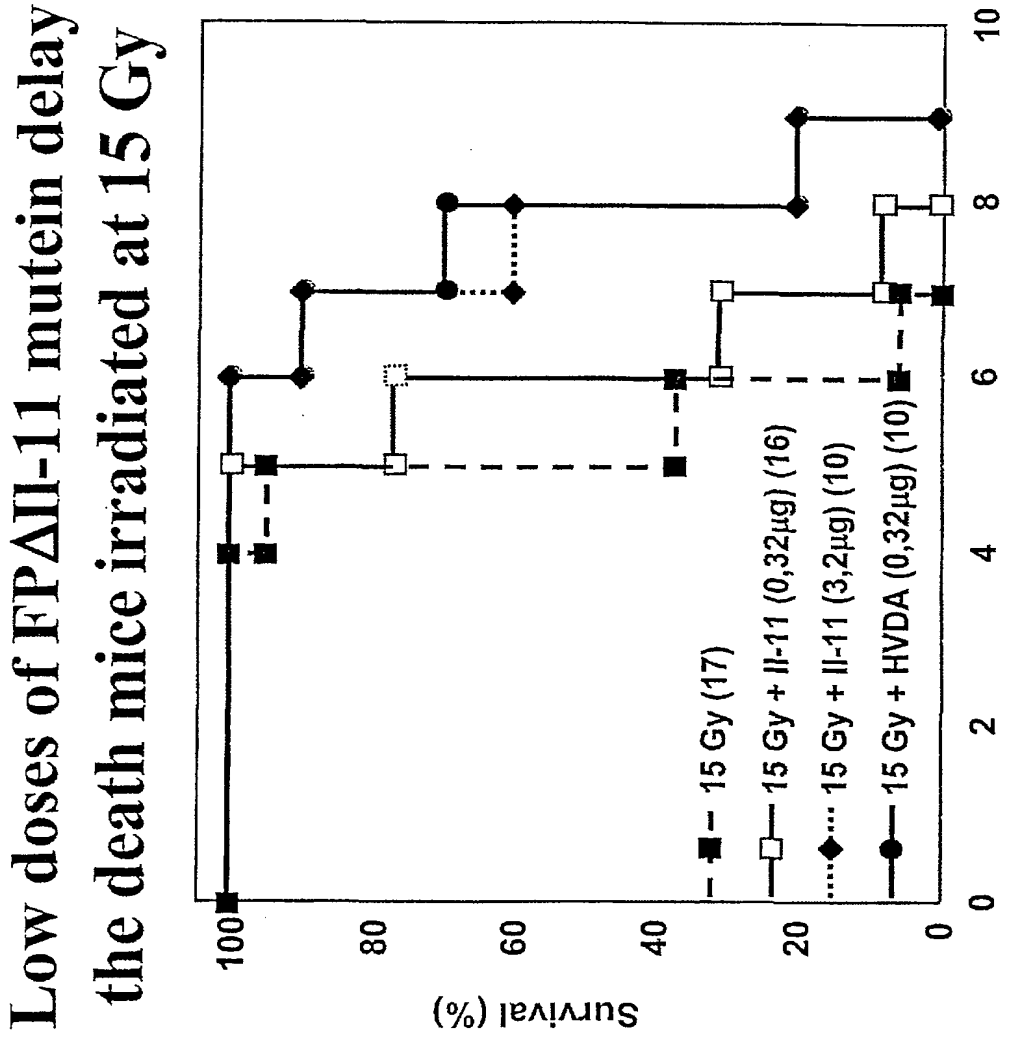
Low doses of FPΔII-11 mutein delay the death mice irradiated at 15 Gy
Survival (%)
100
80
60
40
20
0
0
2
4
6
8
10
Days
15 Gy (17)
15 Gy + II-11 (0,32µg) (16)
15 Gy + II-11 (3,2µg) (10)
15 Gy + HVDA (0,32µg) (10)

FIGURE 21

Parental (non-mutated) nucleotide sequence FPΔIL-11 = SEQ ID NO:77 =

ATG GAC TAC AAG GAT GAC GAT GAC AAG GAA GGT CGT CGT GCA TCT
GTT GCA TCC CCA GAC CCT CGG GCC GAG CTG GAC AGC ACC GTG CTC
CTG ACC CGC TCT CTC CTG GCG GAC ACG CGG CAG CTG GCT GCA CAG
CTG AGG GAC AAA TTC CCA GCT GAC GGG GAC CAC AAC CTG GAT TCC
CTG CCC ACC CTG GCC ATG AGT GCG GGG GCA CTG GGA GCT CTA CAG
CTC CCA GGT GTG CTG ACA AGG CTG CGA GCG GAC CTA CTG TCC TAC
CTG CGG CAC GTG CAG TGG CTG CGC CGG GCA GGT GGC TCT TCC CTG
AAG ACC CTG GAG CCC GAG CTG GGC ACC CTG CAG GCC CGA CTG GAC
CGG CTG CTG CGC CGG CTG CAG CTC CTG ATG TCC CGC CTG GCC CTG
CCC CAG CCA CCC CCG GAC CCG CCG GCG CCC CCG CTG GCG CCC CCC
TCC TCA GCC TGG GGG GGC ATC AGG GCC GCC CAC GCC ATC CTG GGG
GGG CTG **CAC** CTG ACA CTT **GAC** TGG GCC GTG AGG GGA CTG CTG CTG
CTG AAG ACT CGG CTG TGA

Parental (non-mutated) amino acid sequence of FPΔIL-11 = SEQ ID NO:78 =

MDYKDDDDKEGRRASVASPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPA
DGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSS
LKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRA
AHAILGGL**H**LTL**D**WAVRGLLLLKTRL

FIGURE 22

Mutated nucleotide sequence of FPΔIL-11 = SEQ ID NO:79 of the invention =

ATG GAC TAC AAG GAT GAC GAT GAC AAG GAA GGT CGT CGT GCA TCT GTT GCA TCC CCA GAC CCT CGG GCC GAG CTG GAC AGC ACC GTG CTC CTG ACC CGC TCT CTC CTG GCG GAC ACG CGG CAG CTG GCT GCA CAG CTG AGG GAC AAA TTC CCA GCT GAC GGG GAC CAC AAC CTG GAT TCC CTG CCC ACC CTG GCC ATG AGT GCG GGG GCA CTG GGA GCT CTA CAG CTC CCA GGT GTG CTG ACA AGG CTG CGA GCG GAC CTA CTG TCC TAC CTG CGG CAC GTG CAG TGG CTG CGC CGG GCA GGT GGC TCT TCC CTG AAG ACC CTG GAG CCC GAG CTG GGC ACC CTG CAG GCC CGA CTG GAC CGG CTG CTG CGC CGG CTG CAG CTC CTG ATG TCC CGC CTG GCC CTG CCC CAG CCA CCC CCG GAC CCG CCG GCG CCC CCG CTG GCG CCC CCC TCC TCA GCC TGG GGG GGC ATC AGG GCC GCC CAC GCC ATC CTG GGG GGG CTG **GTT** CTG ACA CTT **GCC** TGG GCC GTG AGG GGA CTG CTG CTG CTG AAG ACT CGG CTG TGA

Mutated amino acid sequence of FPΔIL-11 = SEQ ID NO:80 of the invention =

MDYKDDDDKEGRRASVASPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPA DGDHNLDSLPTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSS LKTLEPELGTLQARLDRLLRRLQLLMSRLALPQPPPDPPAPPLAPPSSAWGGIRA AHAILGGLVLTLAWAVRGLLLLKTRL

FIGURE 23

Primers used for inverse PCR mutagenesis of FPΔIL-11:

Muteins	Primers		
H182/V	G422	pACACTTGACTGGGCCGTACGGGGAC (s)	SEQ ID NO:81
	G412	pCAGAACCAGCCCCCCCAGGATGG (as)	SEQ ID NO:82
D186/V	G410	pACACTTGTCTGGGCCGTACGGGGAC (s)	SEQ ID NO:83
	G421	pCAGGTGCAGCCCCCCCAGGATGG (as)	SEQ ID NO:84
D186/A	G411	pACACTTGCCTGGGCCGTACGGGGAC (s)	SEQ ID NO:85
	G421	pCAGGTGCAGCCCCCCCAGGATGG (as)	SEQ ID NO:86
H182/V-D186/V	G410	pACACTTGTCTGGGCCGTACGGGGAC (s)	SEQ ID NO:87
	G412	pCAGAACCAGCCCCCCCAGGATGG (as)	SEQ ID NO:88
H182/V-D186/A	G411	pACACTTGCCTGGGCCGTACGGGGAC (s)	SEQ ID NO:89
	G412	pCAGAACCAGCCCCCCCAGGATGG (as)	SEQ ID NO:90

FIGURE 24

A

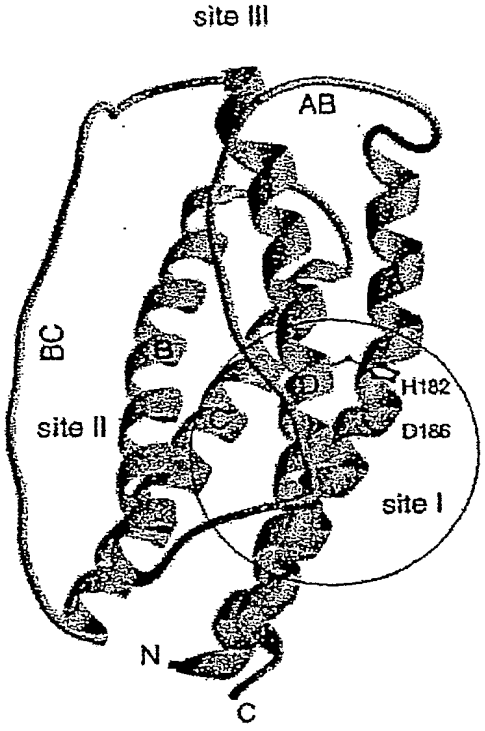

Figure 25A

B

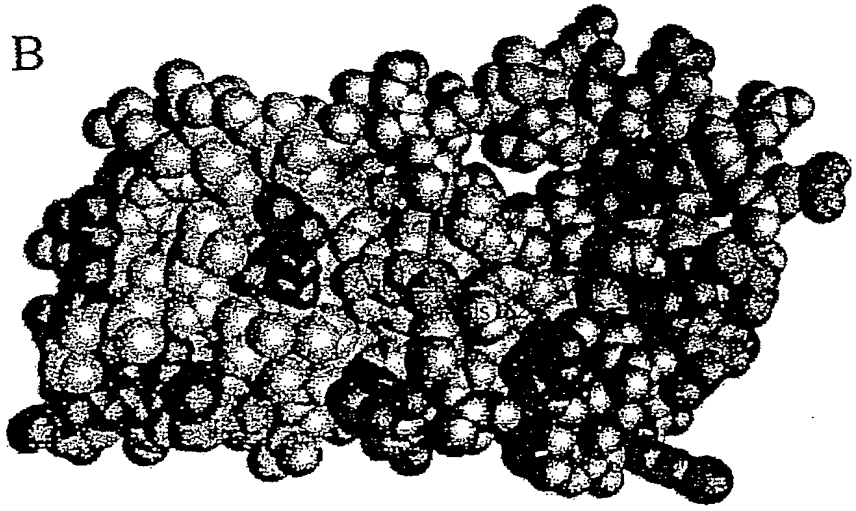

Figure 25B

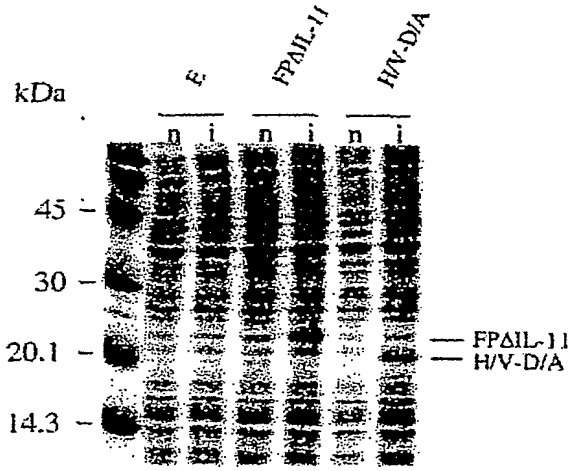

Figure 26

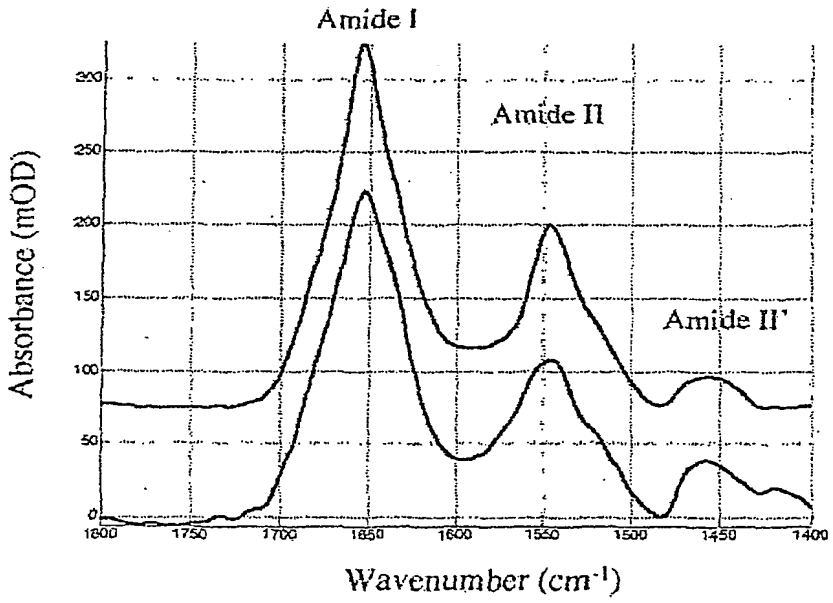
Amide I
Amide II
Amide II'
Absorbance (mOD)
300
250
200
150
100
50
0
1800
1750
1700
1650
1600
1550
1500
1450
1400
Wavenumber (cm-1)

Figure 27

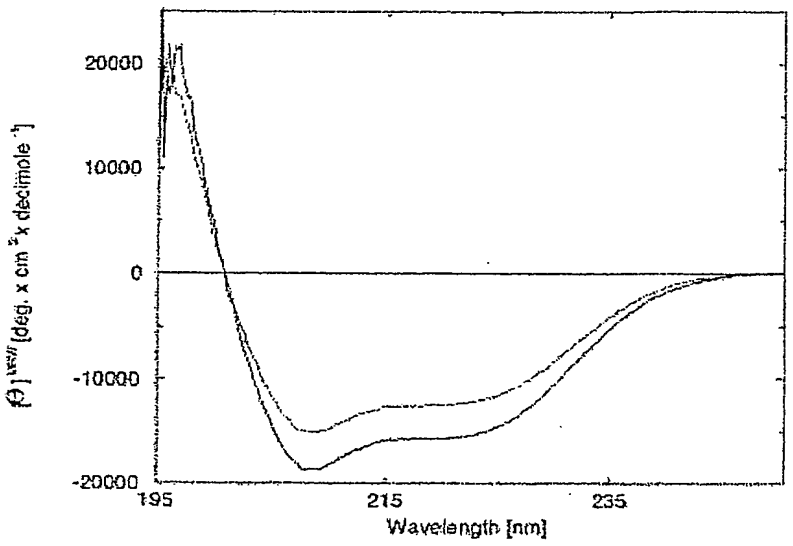
20000
10000
0
-10000
-20000
195
215
235
Wavelength [nm]
[θ]MRW [deg. x cm 2 x decimole -1]

Figure 28

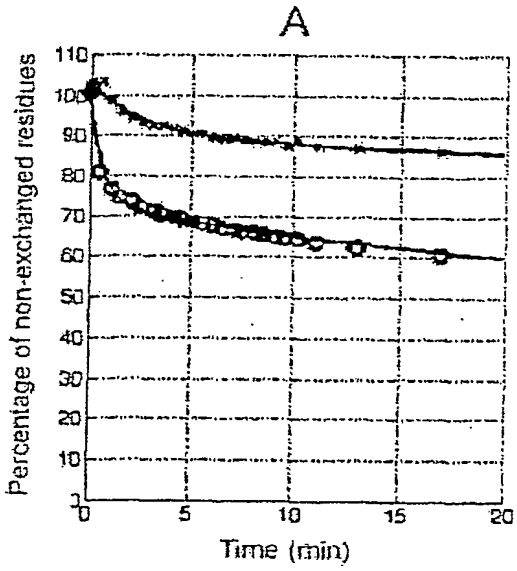

Figure 29A

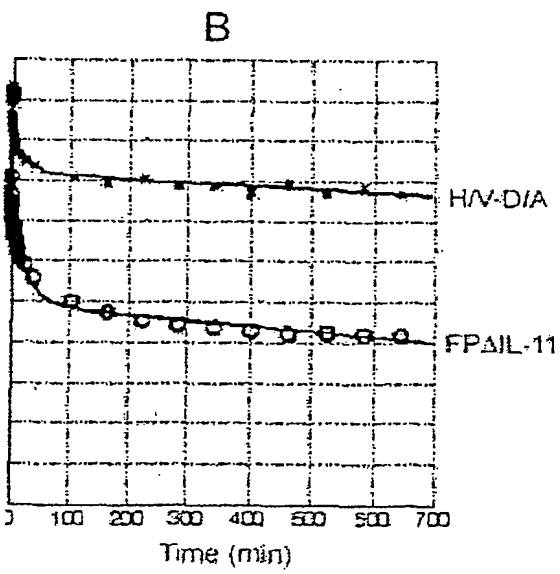

Figure 29B

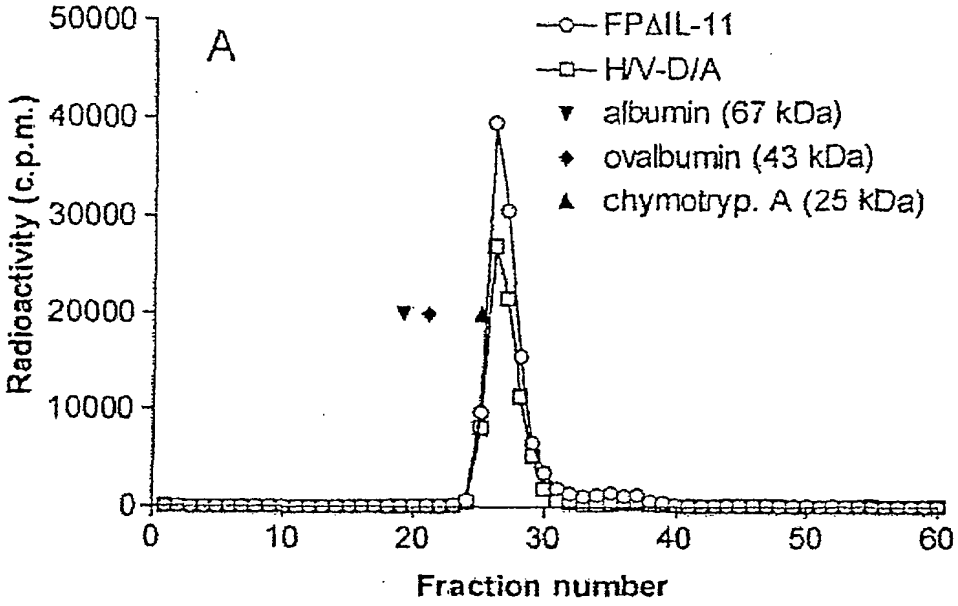

Figure 30A

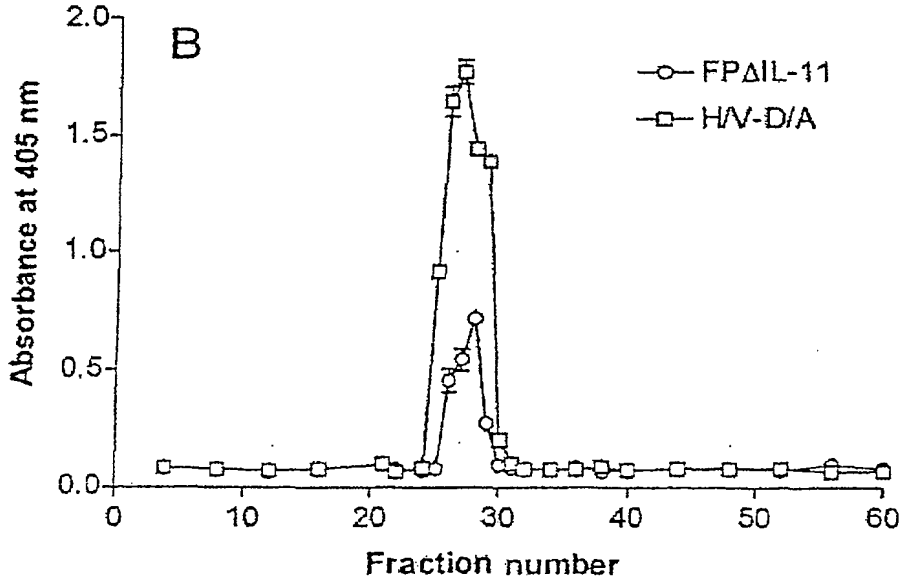

Figure 30B

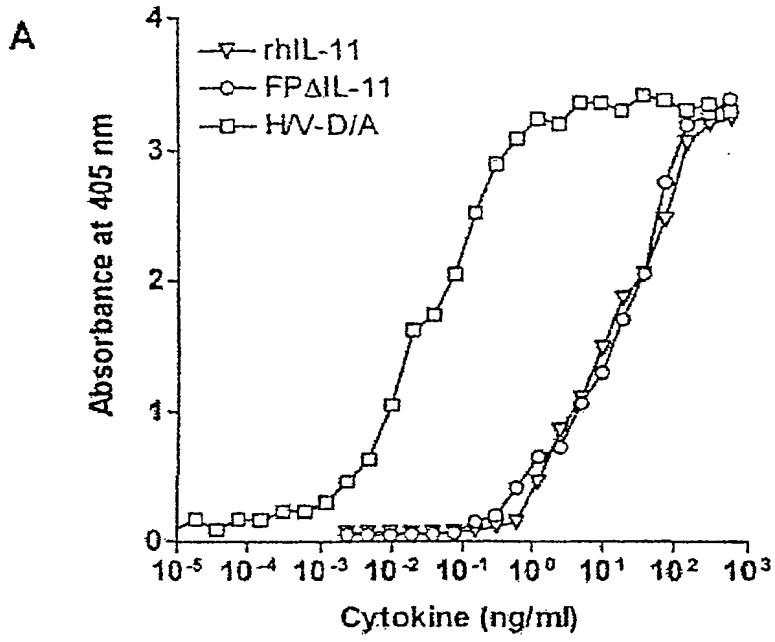

Figure 31A

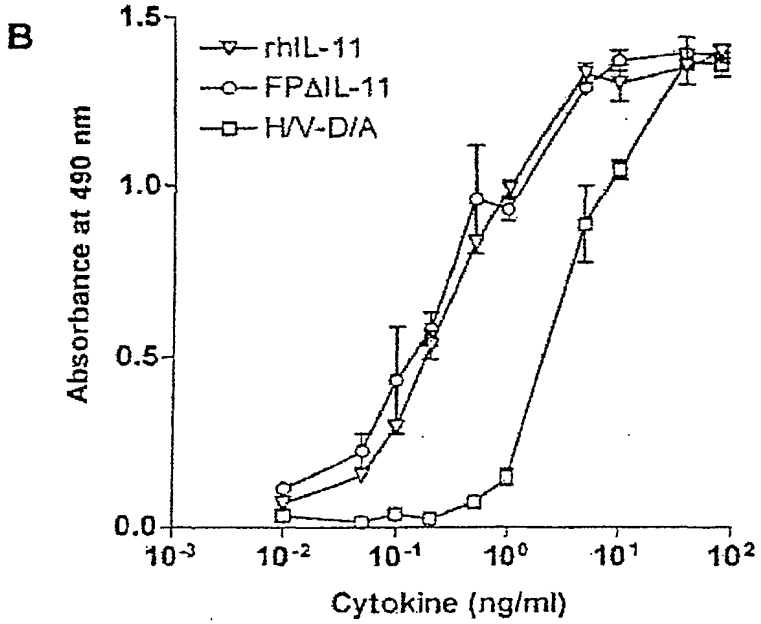

Figure 31B

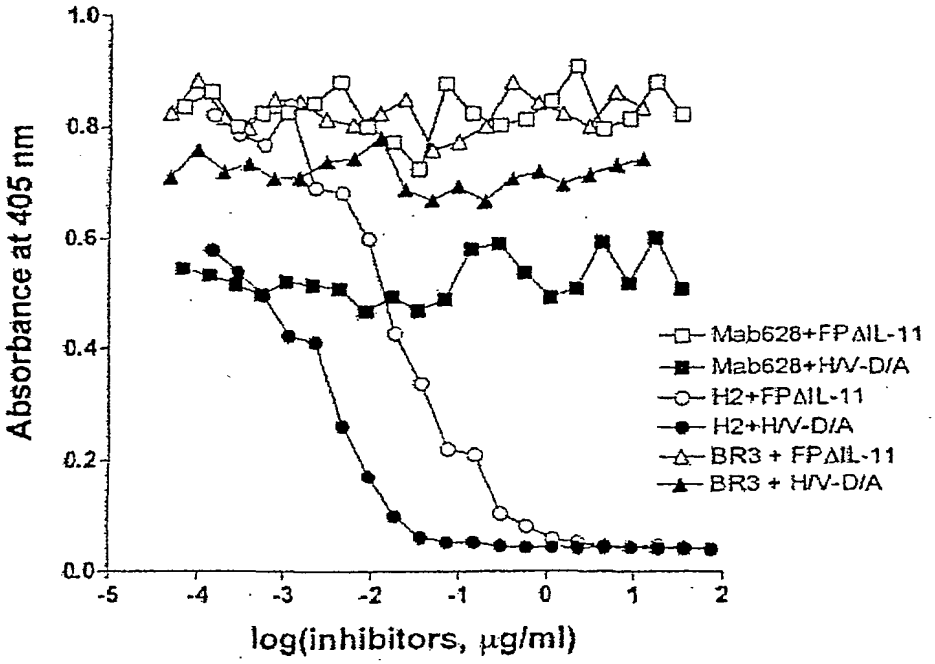
Absorbance at 405 nm
1.0
0.8
0.6
0.4
0.2
0.0
-5
-4
-3
-2
-1
0
1
2
log(inhibitors, µg/ml)
Mab628+FPΔIL-11
Mab628+H/V-D/A
H2+FPΔIL-11
H2+H/V-D/A
BR3 + FPΔIL-11
BR3 + H/V-D/A

Figure 32

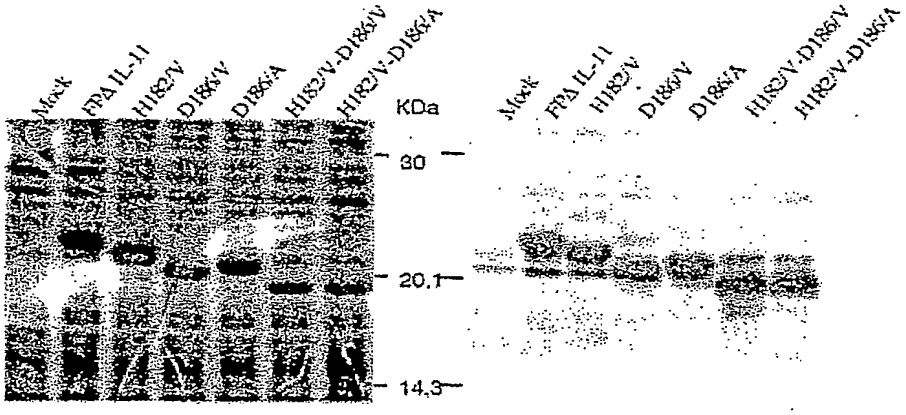
Mock
rTRAIL-J1
H182N
D186V
D186A
H182N-D186V
H182N-D186A
KDa
30
20.1
14.3
Mock
rTRAIL-J1
H182N
D186V
D186A
H182N-D186V
H182N-D186A

Figure 33

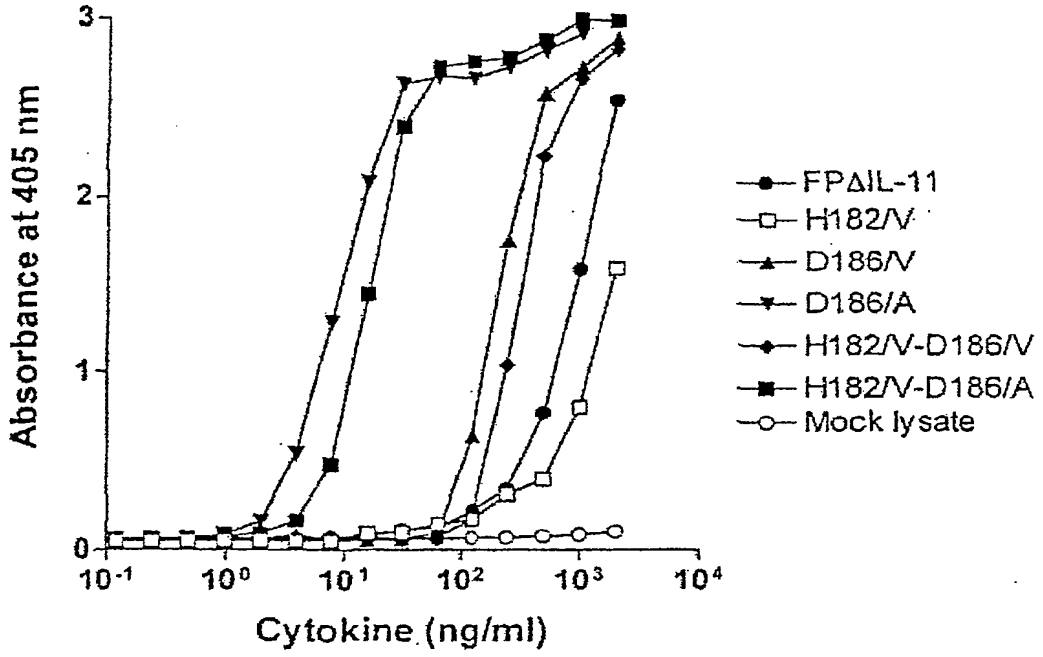
Absorbance at 405 nm
3
2
1
0
10-1
100
101
102
103
104
Cytokine (ng/ml)
FPΔIL-11
H182/V
D186/V
D186/A
H182/V-D186/V
H182/V-D186/A
Mock lysate

Figure 34

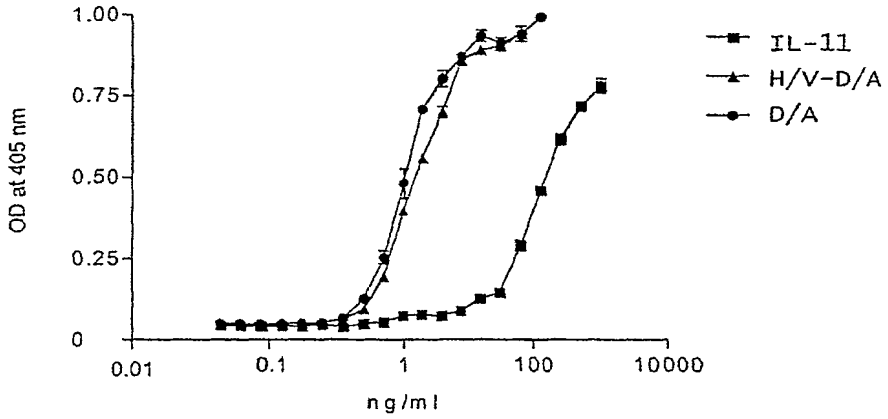
1.00
0.75
0.50
0.25
0
OD at 405 nm
0.01
0.1
1
100
10000
ng/ml
IL-11
H/V-D/A
D/A

FIGURE 35

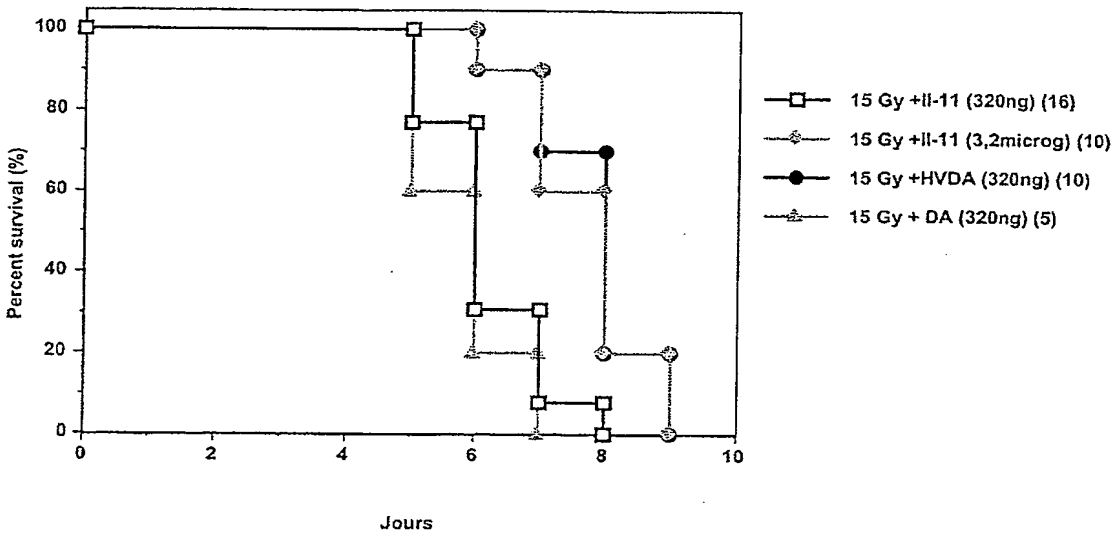
Percent survival (%)
100
80
60
40
20
0
0
2
4
6
8
10
Jours
15 Gy +Il-11 (320ng) (16)
15 Gy +Il-11 (3,2microg) (10)
15 Gy +HVDA (320ng) (10)
15 Gy + DA (320ng) (5)

FIGURE 36